Use of Estimating Tools with the Agency Mission Planning Model (AMPM)



Introduction to the AMPM

- Agency Mission Planning Model (AMPM) maintains official, integrated manifest of Agency's approved and notional content
- AMPM represents both ground (e.g. STMD GCD) and flight efforts (e.g. SMD), as well as technology milestones (e.g. ARMD)
- AMPM aids agency initiatives to forecast capability, services, technology, and infrastructure needs (e.g. SCaN architecture planning)

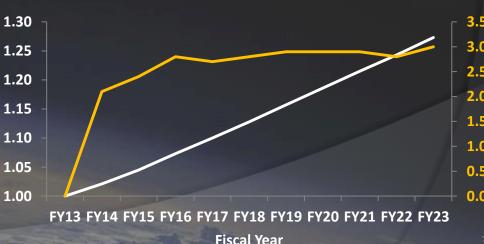
FY14 Agency Mission Planning Model (AMPM) Aligned with FY14 Congressional Request (excludes effects of Sequester)																						
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Introduction to the AMPM cont'd

- The AMPM has been reinvigorated over the past two years
- Product supports budget development and communicates activities over 20-year horizon
- The AMPM aligns with the President's Budget and out-year budget guidance from the CFO
- AMPM serves as a baseline for studies (e.g. issue paper analyses)
- For out-year projects, SID utilizes estimates for project cost/phasing
- NASA New Start Index is used to account for difference in buying power on new-starts

 NASA New Start Index
- AMPM consists mainly of mission cadences, however some accounts show milestones (e.g. ARMD, more coming)





More on the utility of the AMPM

- Allows us to baseline assumptions for future efforts with the Mission Directorates
- Allows us to sanity check the Agency's plans for the future
 - Do our future missions fit within our budget assumptions?
 - Are there budget wedges in the horizon that allow for additional content? How much?
 - Are cadences too aggressive or not aggressive enough?
- Enables a long term view of our planned investments
 - What types of agency investments are growing over time?
 - Are we investing enough in the formulation of new missions?
 - Are our investments in mission development growing over time?



AMPM Analysis Approach

- Project cost/schedule for existing efforts typically known (within some envelope) and/or are restricted (caps)
- Future new-starts are less certain, so CS tools useful in helping determine things like budget phasing (at the portfolio level) and mission cadences at different funding levels
- Much of the research and tools developed for CS estimating are more than sufficient for higher-level enterprise modeling
- The reinvention of the AMPM process and modeling was mainly driven by non-technical factors:
 - Building consensus among our program leadership,
 - Maturing senior leadership's understanding of portfolio dynamics
- The buoyantly driven approach has helped created a common understanding of the agency portfolios and is helping create a common understanding of the drivers impacting the agency's ability to perform (e.g. buying power, effect M/B has on workforce, etc.)



CAD Tools and Other Research

- As we've built up, we've looked to CAD community for tools and research to improve fidelity and in general tell us more
- Examples:
 - Once NASA Cost Engineering Database (ONCE)
 - historical project information
 - Schedule Management and Relationship Tool (SMART)
 - comparing project schedule to similar efforts
 - Phasing Estimation Relationship Formulation Task (PERFT)
 - estimate Phase A-D budget phasing
 - Phase E Cost Analysis for NASA Science Missions, AIAA 2012-5138
 - estimate Phase E costs for Science missions

If you have a tool or research you think we'd find useful, please let us know



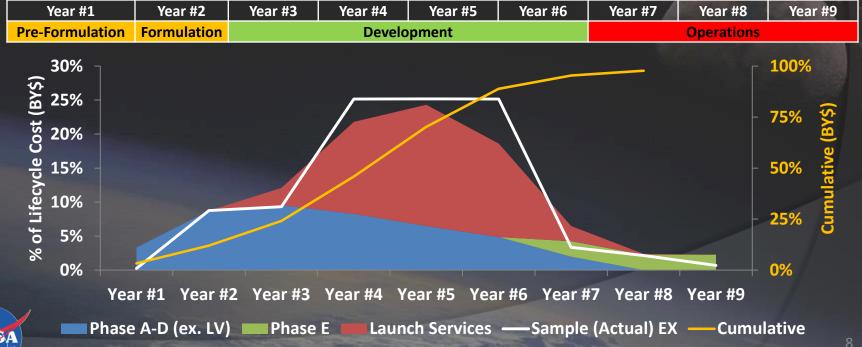
Project Budget Estimation

- Mission class and other characteristics derived from manifest entry
- High-level characteristics (e.g. LCC range) for mission-type determined from ONCE and other sources
- Project schedule approximated and compared with SMART
- Phase E (prime operations) approximated using AIAA 2012 5138 and compared to historical or scaled data
- Launch service cost/phasing estimated (NLS, historical allocations)
- Phase A-D cost calculate and PERFT used to approximate budget phasing
- Again, we're taking a stepping stone approach next we'd like to incorporate ranges/distributions for our input variables and utilize ARGO (more to come on planned next steps)



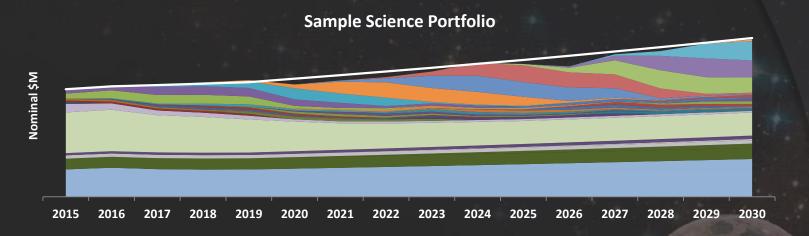
Example

- "small" science mission w/ 4 instruments
- AO with GFE instrument(s)
- Pre-Formulation: 12-months, Formulation: 12-months, Development: 48-months, Operations: 36-months
- Delta II or Falcon 9





Portfolio Roll-up

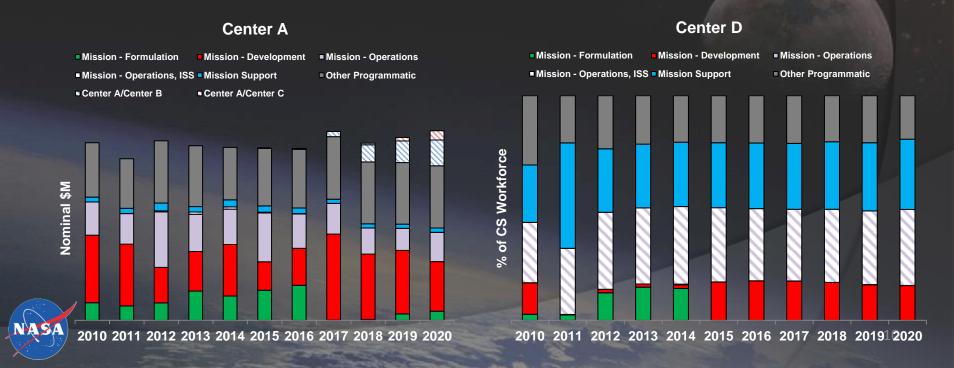


- CS research and tools have allowed us to make the AMPM analysis
 parametric a tool we can essentially iterate on in front of management,
 explain to them what its doing, and then see the results
- Parametric modeling allows us to better communicate the complexities of a multi-portfolio enterprise like NASA and inform senior leadership as they make decisions
- An integrated model approach to the AMPM helps us really view the agency as ecosystem rather than a collection of stovepipes
- We continue to mature the analysis and form new connections to important elements in the enterprise (e.g. impact of funding scenarios on Agency R&TD spending)



Center & Workforce

- As we explore funding scenarios and budget options, we want to ensure we have the right FTE allocations but also have a flow of work that sustains critical workforce functions
- Connection between mission manifest and center FTE forecasting is a recent addition we're building on (some of this is recycling work done in the past that the agency simply hasn't been doing)
- Flow of funds to/FTE demand at centers when we look at budget trades, new starts (MB, Direct/AO), etc.



Future Additions to the AMPM Analysis

- Integration of R&TD efforts into portfolio w/ linkage to possible future manifest activities (i.e. options and decision analysis) (what effect will these activities have on success?)
- Leveraging of TCASE and other technology cost estimating research/tools (what's the OoM to get us from A to Z via some technology pipeline?)
- Workforce skill area mapping to AMPM activities (are we equipped for success?)
- Linkage of major agency/center assets and facilities to project phases (where is the real demand? where are the largest institutional risks that could imped the success of our programs?)
- Integrate risk-adjusted cost/schedule-to-go for existing efforts in portfolio (how much wedge do we really have for new "stuff"?)
- Modeling off-nominal CS performance using historical variance based on things such as mission class, lead center, etc. (when you don't assume success, how much do we have to tailor our strategies/plans?)



Having an Impact

(some lessons learned to pass on)

- To build more support with senior leadership, need to connect what you're doing with the tangibles
- Consensus is only powerful when its broad should be communicating what you're modeling/how you're modeling it to wide range of stakeholders such that everyone understands
- The 70% solution is more than enough for enterprise level portfolio analysis – sometimes even OoM is enough
- Every degree of cross-coupling buys you twice as much impact as every degree of fidelity - segregated analyses that don't connect the dots cross-agency will struggle to resonate with enough key leadership to be impactful
- Total cost is important to a lot of stakeholders but phasing is really the mechanism leadership utilizes and thinks in terms (either consciously or subconsciously)



Again, if you have a tool or research you think we'd find useful, please let us know

Questions?

Visit

http://www.nasa.gov/news/budget/index.html for the latest AMPM release

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